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ADS-B MASPS, rev. A

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Proposed changes to the ADS-B MASPS to more completely define the requirements for an ADS-B Anonymous Mode

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Summary

This working paper is a follow-up to Issue Paper 5 and Working Paper 242A-WP-5-03 and proposes specific changes to section 2.1.2.1 of DO-242 to further define the requirements and limitations on the use of an ADS-B anonymous mode.

2.1.2 Information Transfer Requirements

The ADS-B system shall (R2.1) be capable of transmitting messages containing the information specified in the following subsections. This MASPS does not specify a particular message structure or encoding technique. The information specified in the following subsections can be sent in one or more messages in order to meet the report update requirements specified in Section 3.

Message triggering may be event driven, e.g., entering the approach area, encountering turbulence, etc., or possibly may be turned on by crew action (e.g., emergency, priority handling, etc.). ADS-B applications will need to accommodate missing and/or temporary interruption of required data elements (e.g., if barometric altitude is missing).

2.1.2.1 Identification

The basic identification information to be conveyed by ADS-B shall (R2.2) include the following elements:

1. Call Sign
2. Address
3. Category

The ADS-B system design shall (R2.3) accommodate a means to ensure anonymity whenever pilots elect to operate under flight rules permitting an anonymous mode as described in 2.1.2.1.4. (Most non-IFR flight operations do not require one to fully disclose either the A/V call sign or address. This feature is provided to encourage voluntary equipage and operation of ADS-B by ensuring that ADS-B messages will not be traceable to an aircraft if the operator requires anonymity.)

2.1.2.1.1 Call Sign

ADS-B shall (R2.4) be able to convey an aircraft call sign of up to 7 alphanumeric characters in length [6]. For aircraft/vehicles not receiving ATS services, but providing an ICAO conformant 24 bit aircraft address, and military aircraft the call sign is not required. The use of an anonymous call sign is discussed in 2.1.2.1.4.1 below.

2.1.2.1.2 Address

The ADS-B system design shall (R2.5) include a means (e.g., an address) to 1, correlate all ADS-B messages transmitted from the A/V and 2, differentiate it from other A/Vs in the operational domain.

Those aircraft requesting ATC services will be required in some jurisdictions to use the same 24 bit address for all CNS systems. Aircraft with Mode-S transponders using an

ICAO 24 bit address shall (R2.6) use the same pre-assigned ICAO 24 bit address for ADS-B. Aircraft requesting ATC services shall use the ICAO 24 bit aircraft address for ADS-B. All aircraft/vehicle pre-assigned addresses shall (R2.7) be unique within the operational domain(s) applicable. The use of anonymous aircraft addresses is discussed in 2.1.2.1.4.2 below.

Note 1. For example, all surface vehicles for a given airport need to have unique addresses only within range of the airport; vehicle addresses may be reused at other airports.

Note 2. Correlation of ADS-B messages with transponder codes will facilitate the integration of radar and ADS-B information on the same A/V during transition.

Note 3. ATC correlation of ADS-B reports with IFR flight plans will be facilitated by the use of ICAO 24-bit aircraft addresses.

2.1.2.1.3 Category

Aircraft/vehicle category, as defined by ICAO[6], shall (R2.8) be one of the following:

1. Light aircraft - 7,000 kgs (15,500 lbs) or less
2. Reserved
3. Medium aircraft - more than 7,000 kgs and less than 136,000 kgs (300,000 lbs)
4. Reserved
5. Heavy aircraft 136,000 kgs or more
6. Highly maneuverable (> 5g acceleration capability) and high speed (> 400 knots cruise)
7. Reserved
8. Reserved
9. Reserved
10. Rotorcraft
11. Glider/Sailplane
12. Lighter-than-air
13. Unmanned Aerial vehicle
14. Space/Transatmospheric vehicle
15. Ultralight/Hangglider/Paraglider
16. Parachutist/Skydiver
17. Reserved
18. Reserved
19. Reserved
20. Surface Vehicle - emergency vehicle
21. Surface Vehicle - service vehicle
22. Fixed ground or tethered obstruction

23. Reserved
24. Reserved

Note. 2, 4, 7-9, 17-19, 23 and 24 reserved for future assignment.

2.1.2.1.4 Anonymous Mode

All ADS-B aircraft installations shall use, as a default mode, the assigned aircraft address conformant to ICAO standards. Likewise all ADS-B aircraft required to include a radio call sign with ADS-B shall provide, as a default mode, a radio call sign based on aircraft tail number or flight number. Certain aircraft, installations and operations, as defined below, are permitted to also support the optional use of an anonymous mode. When operating in the anonymous mode neither the flight ID nor the call sign would be uniquely associated with a specific aircraft or operator. ADS-B messages shall unambiguously identify when the anonymous mode is in use.

All ADS-B avionics shall power-up in the default mode. Use of anonymous mode shall require the flight crew to manually override the default mode.

2.1.2.1.4.1 Anonymous Call Sign

When operating in an anonymous mode ADS-B equipped aircraft shall transmit the call sign in the form "VFRxxxx", where xxxx is a randomly selected 4 digit number within the range of 0001 to 9999. The value for the call sign shall be automatically selected when entering the anonymous mode and shall not change for the duration of that anonymous operation (i.e., until the ADS-B avionics is reset or until the avionics is switched out of anonymous mode).

Note. Coordination with ICAO will be necessary to reserve the radio call sign prefix "VFR".

2.1.2.1.4.2 Anonymous Aircraft Address

When operating in an anonymous mode ADS-B equipped aircraft shall transmit a randomly selected value for the aircraft address. The anonymous aircraft address shall be as a minimum 24-bits in length. The random value for the aircraft address shall be automatically selected when entering the anonymous mode and shall not change for the duration of that anonymous operation (i.e., until the ADS-B avionics is reset or until the avionics is switched out of anonymous mode).

Note. Alternative techniques are possible to ensure a high degree of randomness for the generation of the anonymous aircraft address. One possible technique would be extract data from the latitude, longitude and/or time information to initiate the random value generator function.

2.1.2.1.4.3 Fight Crew Input/Output Functions

ADS-B avionics supporting the option for anonymous mode operation shall provide the following flight crew input and output functions:

- Input

  a. manual override of the default ADS-B mode to activate the anonymous mode

  b. manual reset to the default ADS-B mode

  Note. A feature to automatically reset the ADS-B avionics from anonymous mode to default mode based on the aircraft exceeding a pre-set altitude threshold (e.g., 18,000) is permitted. In such cases a manual flight crew reset capability is still required.

- Output

  a. indicator showing when the ADS-B avionics is operating in the anonymous mode

  b. display of the call sign that is being broadcast (i.e., either the anonymous call sign of the form "VFRxxxx" or the default mode radio call sign based on aircraft tail number of flight number)

2.1.2.1.4.4 Allowed use of Anonymous Mode

The use of anonymous mode is allowed only for the following aircraft/vehicle categories, as per 2.1.2.1.3:

a. powered fixed wing aircraft (categories 1, 3, 5 and 6) operating below 18,000 feet altitude;

b. rotorcraft (category 10);

c. glider/sailplane (category 11);

d. lighter-than-air (category 12) ;

Furthermore, the use of anonymous mode is only allowed for uncontrolled VFR operations (i.e., any ADS-B equipped aircraft operating as IFR or controlled VFR would be required to broadcast an ICAO conformant 24-bit aircraft address and the radio call sign based on aircraft tail number or flight number).